

THE SPECIES OF STENOMORPHUS (COLEOPTERA:  
CARABIDAE), WITH DATA ON HETEROGONY  
IN *S. CALIFORNICUS* (MÉN.)

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This is an attempt to define as briefly and as accurately as possible the species of the New World genus *Stenomorphus*. For discussion of the relationships of the genus, see the generic references given below; for a full bibliography, see the *Junk Catalogue*.

*Characters:* Within the Harpalini, the genus is characterized by elongate form; short, smooth head, with two small, sharp foveæ between the eyes; mentum not toothed; subapical segment labial palpus plurisetose; and especially by the remarkable sexual characters: male prothorax relatively elongate; male middle femora angulate or denticulate on lower edge near apex (seen from in front); male front and sometimes middle tibiæ pubescent within; male front tarsi narrowly dilated, with first segment longer but not much wider than following, segments 2-4 (but not 1) biserially squammulose below; male middle tarsi not squammulose; female front tarsi with first segment conspicuously enlarged, at least twice as wide as following.

The species can be classified satisfactorily only by a careful study of the male sexual characters. Females not directly associated with males can often be identified by general appearance and locality, plus the prothoracic and tibial measurements. A good deal of variation must be allowed for in both sexes.

The ratio of length to depth of prothorax (abbreviated below as "prothoracic L/D") varies in males of different *Stenomorphus* from about 1.45 to 2.10, and is much more useful in classification than the ratio of length to width ("prothoracic L/W"), which varies only from about 1.15 to 1.50. Length of prothorax is measured at middle; depth, along a line perpendicular to the dorsal surface and immediately before the front coxæ (Pl. 1, fig. 15). The specimen must be rotated on the long axis until the least depth is found. Width of head (across eyes) and of prothorax is, of course, the greatest width. Length of hind tibia is length from middle of apex of femur, when the tibia is at right angles to the femur; width of tibia is greatest width at

apex. Total length is to apex of elytra; width, greatest width of elytra. Measurements used in deriving ratios must be made carefully, with a properly equipped microscope.

*Heterogony*<sup>1</sup>: If the proportions of the male prothorax are to be used in classification, it is important to know whether there is heterogonic variation, *i. e.* whether the proportions of the prothorax depend upon the absolute size of the insect. Purely heterogonic characters are sometimes striking, as in the males of some Scarabæidæ, but they are of no more significance in taxonomy than mere variations in body size. On Plate 2A I have accordingly charted the L/D values against absolute length of prothorax for a series of males of *Stenomorphus californicus*. If the L/D value were strongly heterogonic, the points charted would fall into a fairly regular line ascending to the right. The actual results of the tabulation show that weak heterogony is probably present, but it certainly is not strong enough to forbid the use of the L/D value in distinguishing species of anything like similar size.

*Genitalia*: I have examined the male genitalia of several species. They show only slight specific differences, much less striking than the differences in the external sexual characters, and not of a sort likely to be useful.

*Acknowledgments*: This paper is based on material examined in or borrow from the United States National Museum, the British Museum, the American Museum of Natural History, the Philadelphia Academy of Natural Sciences, the California Academy of Sciences, Ohio State University, the Museum of Comparative Zoölogy, and the private collections of Mr. H. C. Fall and the writer. I am especially indebted to Mr. K. G. Blair, Dr. E. C. Van Dyke, Mr. L. L. Buchanan, and Mr. J. N. Knull for arranging loan of material

#### STENOMORPHUS Dej.

Dejean 1831, p. 696; G. Horn 1881, pp. 180, 183, Pl. 10, fig. 134; Tschitschérin 1900, pp. 343, 352: *Agaosoma* Ménétries 1844, p. 63.

*Genotypes*: *angustatus* Dej. (*Stenomorphus*), *californicus* Mén. (*Agaosoma*); both haplotypes, by single reference.

<sup>1</sup> Cf. Julian S. Huxley, "Problems of Relative Growth" (Dial Press, 1932), especially p. 55.

KEY TO SPECIES ( $\delta$  only)

1. Front femur  $\delta$  dentate below near apex .....1. *dentifemoratus* Chd.  
 ... Front femur  $\delta$  not dentate.....2
2. L/D  $\delta$  prothorax 1.45-1.55 (rarely more); middle femur  $\delta$  sinuate or obtusely angulate below near apex; outer edge middle tibia relatively densely spiny.....2. *convexior* Notm.  
 ... L/D  $\delta$  prothorax 1.6-2.1; middle femur  $\delta$  acutely, rectangularly, or (rarely) somewhat obtusely dentate or angulate below near apex; outer edge middle tibia with fewer spines .....3
3. Middle tibia  $\delta$  densely pubescent within near apex.....4  
 ... Middle tibia  $\delta$  not densely pubescent within.....5
4. L/D  $\delta$  prothorax 1.6-1.75.....3. *penicillatus* n. sp.  
 ... L/D  $\delta$  prothorax 1.8-2.0.....4. *sinaloæ* n. sp.
5. L/D  $\delta$  prothorax 1.6-1.8.....6  
 ... L/D  $\delta$  prothorax 1.8-2.1.....8
6. L/W  $\delta$  prothorax about 1.45; L/W hind tibia about 7.0; tooth  $\delta$  middle femur reaching well beyond apex of femur; length ( $\delta$ ) 17 mm.....5. *alius* n. sp.  
 ... L/W  $\delta$  prothorax about 1.2-1.35; L/W hind tibia about 5.5-6.0; tooth middle femur  $\delta$  reaching about opposite apex femur; length 12.5 mm. or less.....7
7. L/W  $\delta$  prothorax 1.3-1.35; prothorax less dilated anteriorly; length 12-12.5 mm. ....6. *angustatus* Dej.  
 ... L/W  $\delta$  prothorax about 1.2; prothorax more dilated anteriorly; length 10.5 mm. ....7. *brasiliensis* n. sp.
8. Middle femur  $\delta$  very finely notched below near apex; middle tibia  $\delta$  straight .....8. *manni* Darl.  
 ... Middle femur  $\delta$  much more coarsely notched or dentate; middle tibia  $\delta$  more or less distinctly arcuate.....9. *californicus* Mén.

## 1. STENOMORPHUS DENTIFEMORATUS Chd.

(Pl. I, figs. 1, 16, 17)

Chaudoir 1844, p. 478

Black; very slender, moderately convex; head distinctly more than three-fourths width prothorax, relatively wider than in most *Stenomorphus*; elytra deeply striate; L/W hind tibia 7-7.5. *Male* prothoracic L/D 1.9 or slightly less; front femur finely, acutely dentate below about one-fourth from apex; middle femur rather finely, acutely dentate below at apex; middle tibia arcuate, not densely pubescent within. *Female* prothoracic L/D 1.45-1.6. Measurements: male, 14-14.5 by 3.4-3.7; female, 14-15 by 3.9-4.2 mm.

*Type*: from the cold plateaux of Colombia; probably now in

Oberthür Collection (not seen). *Material seen*: Costa Rica: male, female, Escazu, 1,200 m.; male, San José; female, Chitaria, 600 m.; female, Tempirque, Guanacosta. It is impossible to be absolutely sure that these specimens represent Chaudoir's species, but they answer his brief diagnosis.

This is the only described *Stenomorphus* of which I have not seen either type material or topotypes.

## 2. STENOMORPHUS CONVEXIOR Notman

(Pl. I, figs, 2, 3, 24, 25; Pl. 2B)

Notman 1922, p. 103

Black to rufescent; rather stout (in genus), moderately convex; head three-fourths or slightly more width prothorax; elytra moderately deeply striate; L/W hind tibia 5.5-6.0; middle tibia more densely spiny than in other *Stenomorphus*. *Male* prothoracic L/D 1.45-1.55 (rarely more); front femur simple; middle femur obtusely angulate or merely sinuate below near apex; middle tibia rather strongly arcuate, moderately (not very densely) pubescent within. *Female* prothoracic L/D 1.3-1.5. Measurements: male, 13-15.5 by 3.8-4.4; female, 11-14 by 3.5-4.2 mm.

*Type*: Tucson, Arizona, in collection Bureau of Plant Industry, Harrisburg, Pa. (not seen). *Material seen*: Arizona: 2 males, 4 females Tucson and vicinity; male, Mt. Mildred, Baboquivari Mts.; female "Ariz."; Mexico: State of Sinaloa, male, 2 females, Presidio R. near Union; 5 males, 10 females Vanadillo (spelled also Venedio); 4 males, 12 females, Mazatlan: State of Jalisco, 2 males, 1 female, Cocula; male, Guadalajara: State of Morelos, male, Cuernavaca. Also 3 females "Sonora or Sinaloa, in chicken crop, said to kill chickens."

I have examined also 2 males, 2 females (13-15 mm.) from Cuautla, Morelos, Mexico (Koebele Coll., Cal. Acad.) which agree with the preceding series except they are less stout, with male prothoracic L/D about 1.65. These probably represent a local or individual variation rather than a different species.

## 3. *Stenomorphus penicillatus* Darlington, n. sp.

(Pl. 1, figs. 4, 18, 19; Pl. 2B)

Black or piceous; moderately slender and convex; head three-fourths ( $\pm$ ) width prothorax; elytra moderately deeply striate; L/W hind tibia 5.5-6.0. *Male* prothoracic L/D 1.6-1.75; front femur simple; middle femur strongly, rectangularly ( $\pm$ ) angulate



or dentate below near apex; middle tibia arcuate, rather densely pubescent within in apical one-third or one-fourth. *Female* prothoracic L/D 1.35-1.45. Measurements: male, 15-17.5 by 4-4.5; female, 13-14.5 by 3.6-4.1 mm.

*Types*: Mexico. Holotype male (M. C. Z. No. 22112), Truqui, from the Leconte Collection: paratypes, Cuernavaca (2 males Höge Collection, B. M.; 1 male, 1 female, O. W. Bryant Collection, U. S. N. M.; 1 male, Koebele Collection, Cal. Acad.; 1 female Höge Collection, Am. Mus.); Colima Vulcano (1 male, 3 females, L. Conrad Collection, U. S. N. M.).

#### 4. *Stenomorphus sinaloæ* Darlington, n. sp.

(Pl. 1, figs. 5, 22, 23; Pl. 2B)

Black or piceous; moderately slender and convex; head three-fourth ( $\pm$ ) width prothorax; elytra moderately deeply striate; L/W hind tibia 6-6.5. *Male* prothoracic L/D 1.8-2.0; front femur simple; middle femur strongly, rectangularly or acutely dentate below near apex; middle tibia arcuate, densely pubescent within in apical one-third or more. *Female* prothoracic L/D 1.5-1.6. Measurements: male, 16-17 by about 4.5; female, 13.5-14 by about 4.5 mm.

*Types*: Mexico. Holotype male (U.S.N.M.) and 2 male, 3 female paratypes (pair in M. C. Z., No. 22113) all labeled merely "Sinaloa, Mex."

#### 5. *Stenomorphus alius* Darlington, n. sp.

(Pl. 1, figs. 6, 18)

Black; moderately slender and convex; head slightly less than three-fourth width of prothorax; elytra rather deeply striate; L/W hind tibia about 7. *Male* prothoracic L/D 1.8; L/W 1.45; front femur subangulate below near apex, but not dentate; middle femur with strong, acute tooth below at apex, reaching beyond apex of femur; middle tibia faintly arcuate, not densely pubescent within. *Female* unknown. Measurements: male, 17 by 4.8 mm.

*Type*: Venezuela. Unique male (B. M.) without more exact locality, but labeled "3218" and "Bowring. 63, 47\*".

#### 6. *STENOMORPHUS ANGUSTATUS* Dej.

(Pl. 1, figs. 7, 26, 27)

Dejean 1831, p. 697

Black or piceous; moderately slender and convex; head about three-fourth width of prothorax; elytra moderately deeply striate;

L/W hind tibia 5.5-6.0. *Male* prothoracic L/D 1.7-1.75 ( $\pm$ ); L/W 1.3-1.35 ( $\pm$ ); front femur simple; middle femur moderately strongly, acutely dentate, tooth reaching about opposite apex of femur; middle tibia arcuate, not densely pubescent within. *Female* prothoracic L/D 1.5 ( $\pm$ ); L/W 1.1-1.2. Measurements: male, 12.5-13 by 3.6; female 11-14 by 3.2-4.0 mm.

*Type*: neighborhood of Cartagena (Colombia); probably now in Oberthür Collection (not seen). The type was a single female (supposed by Dejean to be a male), about 10.7 mm. long. *Material seen*: 1 male, 2 females from type locality, "1103", "Bowring. 63-47\*"; 1 male, 1 female Caracas (Venezuela), "6112a" and "6112b" (all B. M.).

### 7. *Stenomorphus brasiliensis* Darlington, n. sp.

(Pl. 1, figs. 8, 20, 21)

Piceous; less elongate than usual, moderately convex; head about three-fourth width prothorax; elytra moderately deeply striate; L/W hind tibia about 6. *Male* prothoracic L/D about 1.6; L/W about 1.2; front femur simple; middle femur moderately, acutely dentate below, tooth reaching about opposite apex of femur; middle tibia faintly arcuate, not densely pubescent within. *Female* prothoracic L/D between 1.4 and 1.45; L/W between 1.05 and 1.1. Measurements: male, 10.5 by 3.1; female, 11 by 3.4 mm.

*Types*: Brazil. Holotype male and paratype female from the Thomson Collection, "77-15 k." (both B. M.).

### 8. *STENOMORPHUS MANNI* Darl.

(Pl. 1, figs. 9, 29, 30)

Darlington 1934, p. 102

Rufo-piceous to black; slender, moderately convex; head usually less than three-fourth width prothorax; elytra moderately deeply striate; L/W hind tibia about 7 or more. *Male* prothoracic L/D 2 or slightly less; L/W 1.4 ( $\pm$ ); front femur simple; middle femur finely notched at lower apical angle; middle tibia straight or even a little recurved, not densely pubescent within. *Female* prothoracic L/D 1.6 ( $\pm$ ); L/W 1.1 ( $\pm$ ). Measurements: male, 12.5-15.5 by 3.3-3.8; female, 9-12.5 by 2.7-3.7 mm

*Types*: Manneville, Haiti (M. C. Z., 1 paratype now in U. S. N. M.). *Additional material*: good series, virtual topotypes, Douillard (near Port-au-Prince), Haiti, E. M. Ducasse collector.

## 9. STENOMORPHUS CALIFORNICUS (Mén.)

(Pl. 1, figs. 10-14, 31-39; Pl. 2A, 2B)

Ménétriés 1844, p. 63 (Agosoma); *rufipes* Leconte 1859, p. 59; *batesi* Casey 1914, p. 168; *scolopax* Casey 1914, p. 169; *arcuatus* Casey 1924, p. 122; *parallelus* Casey 1924, p. 122.

Rufous to piceous or (more rarely) black; elongate, moderately convex, but less so than other species; head three-fourth or less width prothorax; elytra with striæ somewhat variably impressed, usually shallower than in other species; L/W hind tibia 6-7.5, tibia less strongly ridged or grooved than usual in genus. *Male* prothoracic L/D 1.8 (very rarely a little less)—2.1; L/W 1.15-1.4; length prothorax/length elytra about 0.50 to just over 0.60; front femur simple or (very rarely) faintly subangulate below near apex; middle femur with moderate, acute, rectangular, or (rarely) obtuse tooth below near apex; middle tibia more or less arcuate, not densely pubescent within. *Female* prothoracic L/D 1.6-1.75 ( $\pm$ ); L/W 1.05-1.15 ( $\pm$ ).

Measurements: male, 9-17 by 2.6-4.5; female, 9.5-13 by 2.8-4.0 mm. (extremes rare).

*Types: californicus*, from California, no more exact locality (cotypes in M. C. Z. and probably Leningrad Museum); *rufipes*, (eastern) United States-Mexico boundary, Berlandière coll. (type in M. C. Z.); *batesi*, Guanajuato, central Mexico (type in B. M.); *scolopax*, Ft. Worth, Texas (types in U. S. N. M.); *parallelus*, McPherson, Kansas (type in U. S. N. M.); *arcuatus*, Dallas, Texas (type in U. S. N. M.).

*Material seen*: Including the types (I have examined all those listed above except the Leningrad cotypes), I have seen a very large series of this species from Missouri, Kansas, Oklahoma, Louisiana, Texas (including SW Texas and Brownsville) and Mexico. The Mexican specimens I have seen are 1 female, Victoria; 1 female, Hildago; 1 male Tejupilco, SW State of Mexico; 1 male (type *batesi*) Guanajuato; 1 female Cocula, Jalisco; 1 female Las Parras (inland from Loreto—W. M. Mann), Baja California. The species is sometimes common at light in Texas, especially near Brownsville.

*Discussion*: Dr. Van Dyke writes me that he has never seen a *Stenomorphus* from the State of California and doubts if the genus occurs there, and Horn long ago made a similar statement (1882, p. IV). There are, however, two specimens in the Leconte Collection (M. C. Z.) which purport to be Californian. One,

although without locality label, bears a penciled label, "*californicus* Mén. Type !". It is evident from Ménétriés' original description (and from Chaudoir, 1844, 478) that he had more than one specimen, and Leconte is known to have exchanged extensively with Russian coleopterists, so there is no reason to doubt that this really is a cotype of *californicus*. It is a large male, about 13.5 mm. long (Ménétriés' specimens were "7-8 lignes"), but within the range of eastern specimens of the species. The second specimen is labeled "*Agaosoma californicum*, Berl. Mus. Ménét". It is undoubtedly the specimen referred to by Leconte (1860, p. 28, Pl. 1, figs. 5, 5a) as from "Sacramento? California", collected by Woznessensky, who seems to have been a reputable source of Californian material. It is a very large male (17 mm.), but otherwise does not differ significantly from eastern males. I have seen a single (also very large) female specimen, which seems unquestionably to be *californicus*, from Lower California (U. S. N. M.), and the species ranges to the Pacific on the mainland of Mexico. I see no reason to doubt, therefore, that, if Ménétriés' types did not come actually from the State of California, they came from the peninsula.

Casey's *Stenomorphus batesi* was based on the figure of "*rufipes*" in the *Biologia* (Bates 1882, Pl. 3, fig. 22). I have before me, borrowed from the British Museum, the male from Guanajuato, central Mexico, from which the figure was made, and which is therefore the type of Casey's species. The figure is very inaccurate. In the figure the prothorax is about 0.64 times long as elytra, in the specimen it is about 0.55; in the figure the prothoracic L/W is about 1.7, in the specimen it is 1.37. The specimen is certainly of maximum narrowness for *californicus*, as is the male from Tejupilco, but I do not believe these specimens can represent more than a minor local variation, of no significance unless it proves constant in large series.

Leconte's female type of *rufipes*, Casey's male and 3 female types of *scolopax*, the female type of *parallelus*, and the male (called female by Casey) type of *arcuatus* are all more or less normal eastern specimens of the present species.

In spite of much variation even in single localities (Pl. 2A) and more over its entire range (specimens from "California" run very large; those from central Mexico very narrow), *cali-*



*fornicus* can easily be recognized by the usually rufescent color, somewhat depressed form, and usually relatively shallow elytral striæ, as well as by measurements and sexual characters.

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#### EXPLANATION OF PLATES

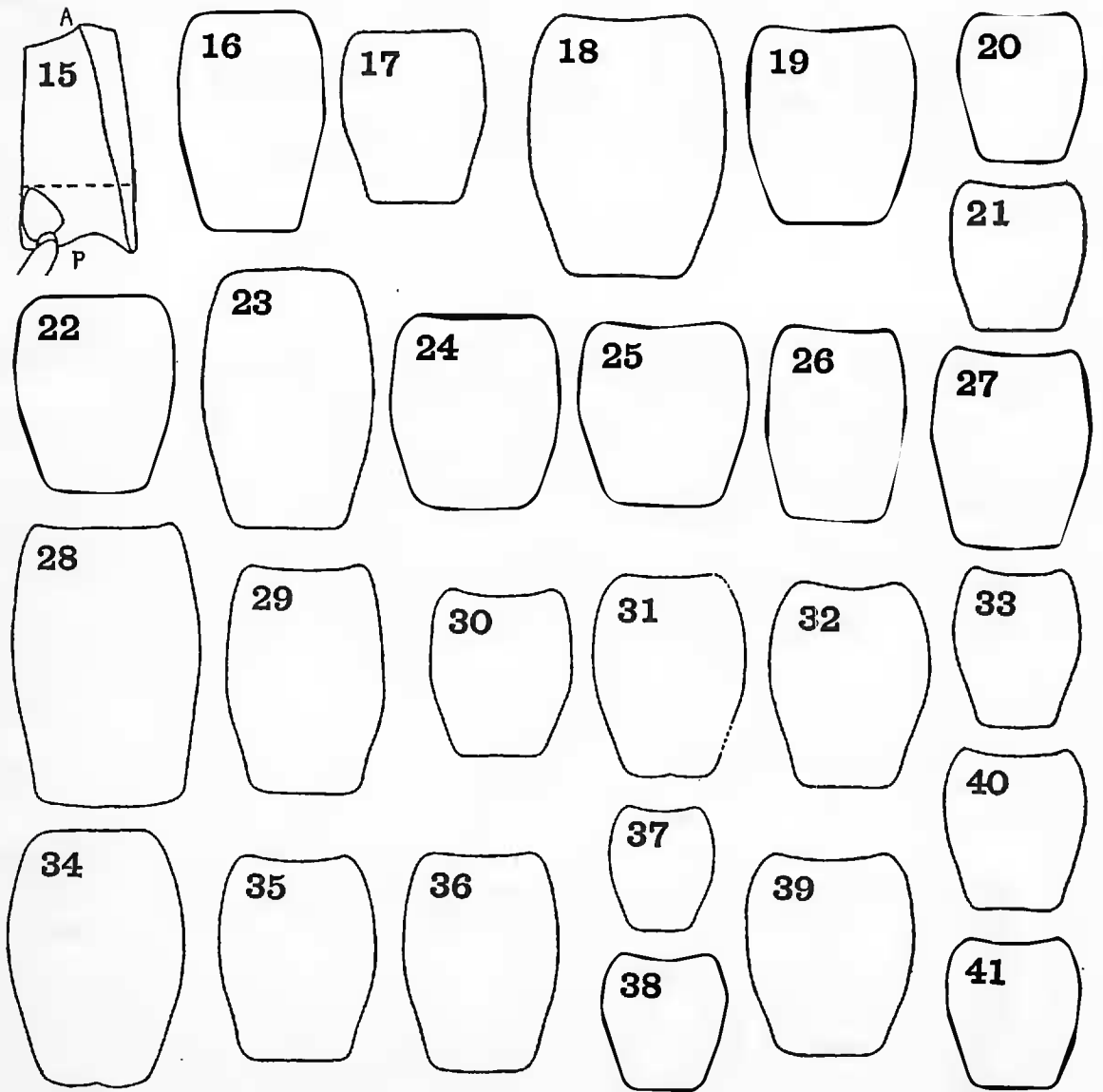
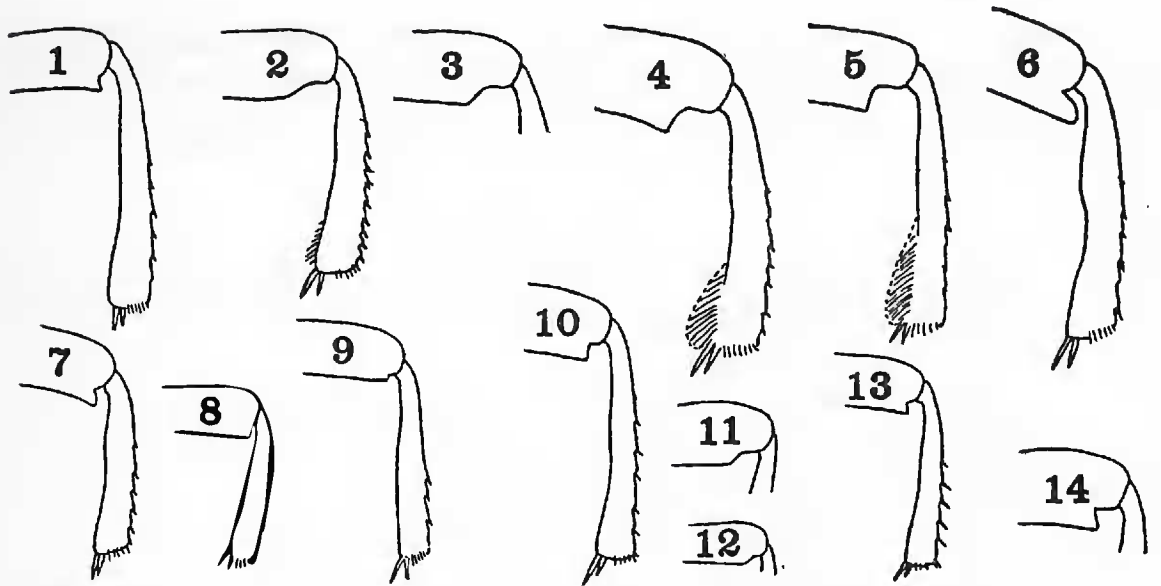
##### PLATE I

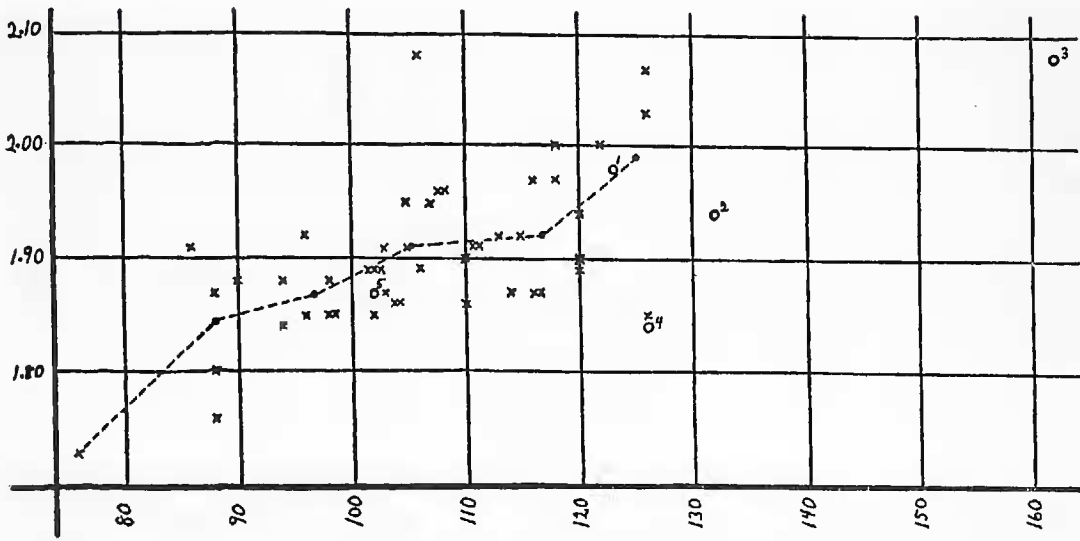
*Figs. 1-14*, camera-lucida outlines of middle legs (tibia and apex of femur, seen from in front) of *Stenomorphus* males:

1. *dentifemoratus* Chd., Escazu, Costa Rica (B. M.); 2. *convexior* Notm., St. Xavier Msn., Tucson, Arizona (Cal. Acad.); 3. same, Venedios, Sinaloa, Mexico (Cal. Acad.); 4. *penicillatus* Darl., type; 5. *sinaloæ* Darl., paratype (U. S. N. M.); 6. *alius* Darl., type; 7. *angustatus* Dej., Cartagena (B. M.); 8. *brasiliensis* Darl., type; 9. *manni* Darl., type; 10. *californicus* (Mén.), type *scolopax*; 11. same, cotype *californicus*; 12. same, Brownsville Texas (smallest male, U. S. N. M.); 13. same, type *arcuatus*; 14. same, (? California) (big Leconte male).

*Fig. 15*, prothorax of male *Stenomorphus manni* Darl., from left side, to show (broken line) method of measuring depth.

*Figs. 16-41*, camera-lucida outlines of prothoraces of *Stenomorphus*: 16. *dentifemoratus* Chd., male, Escazu, Costa Rica (B. M.); 17. same, female, Escazu, Costa Rica (B. M.); 18. *penicillatus* Darl., male, type; 19. same, female, Cuernavaca, Mexico (B. M.); 20. *brasiliensis* Darl., male, type; 21. same, female, paratype; 22. *sinaloæ* Darl., female, paratype (U. S. N. M.); 23. same, male, paratype (U. S. N. M.); 24. *convexior* Notm., male, St. Xavier Msn., Tucson, Arizona (Cal. Acad.); 25. same, female, St. Xavier Msn., Tucson, Arizona (Cal. Acad.); 26. *angustatus* Dej., male, Cartagena (B. M.); 27. same, female, Cartagena (B.





M.); 28. *alius* Darl., male, type; 29. *manni* Darl., male, type; 30. same, female, paratype (M. C. Z.); 31. *californicus* (Mén.) male, cotype; 32. same, male, Brownsville, Texas (M. C. Z.); 33, same, male, type *arcuatus*; 34. same, male (? California) (big Leconte male); 35. same, male, type *scolopax*; 36. same, male, type *batesi*; 37. same, male, Brownsville, Texas (smallest male, U. S. N. M.); 38. same, female, type *rufipes*; 39. same, female, Las Parras, Baja California (U. S. N. M.); 40. same, female, paratype *scolopax*; 41. same, female, type *parallelus*.

## PLATE II

*A (above)*. Variation and heterogony in prothoraces of males of *Stenomorphus californicus* (Mén.) (*cf. ante*). Abscissæ: lengths of prothorax in units of about 1/30 mm. (153 of my units = 5 mm.). *Ordinates*: ratios of length over depth (L/D) of prothorax, measurements being to nearest 1/30 mm. Points plotted as "x" = specimens from Brownsville, Texas (14 specimens from collection Ohio State University; 9, U. S. N. M.; 24, P. J. Darlington Jr.). Dotted line connects averages for groups 81-90, 91-100, etc. The main graph has been limited to Brownsville specimens, to avoid introducing geographical variation, but a few other specimens have been added for comparison, each plotted as "o". They are 1 (? California) (cotype *californicus*); 2, Guanajuato, Mexico (type *batesi*); 3, (? California) (big Leconte male); 4, Ft. Worth, Texas (type *scolopax*); 5, Dallas, Texas (type *arcuatus*). The "o's" have been omitted in computing averages.

*B (below)*. Approximate known ranges of *Stenomorphus* in North America:

- \\ \\ *californicus* (Mén.). Dots represent extreme localities for this species; localities not of special interest are omitted.
- /// *convexior* Notm.
- ||| *penicillatus* Darl.
- = *sinaloæ* Darl.

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## SWARMING OF *Haltica bimarginata* SAY

This common alder flea beetle has been reported to be swarming in enormous numbers this spring. On March first, I noticed very large numbers assembling in sheltered areas on Mt. St. Helena. They were acting much as does our common ladybeetle, *Hippodamia convergens* Muls., under similar circumstances.—E. C. Van Dyke.